

19-30, 32-37, 39-53, 55-74, 77, 79 and 81-94 stand rejected under 35 U.S.C. 102(e) allegedly as being anticipated by Shennib '889.

Applicant again takes issue with the rejection of specified claims of this application under the judicially created doctrine of obviousness-type double patenting as being unpatentable over specified claims of Shennib '889. The claims of the patent and the present application are not different solely as a result of obvious wording variations as contended by examiner, for reasons amply set forth below.

And again, applicant traverses the rejection of claims of the present application under 35 U.S.C. 102(e) as being anticipated by Shennib '889.

Shennib '889 discloses a hearing device adapted to be worn within the ear canal for imparting audible vibrations to the tympanic membrane of the wearer. The device provides a direct vibrational drive for the tympanic membrane through a vibrationally conductive assembly that couples vibrations from a vibratory transducer positioned proximal to the tympanic membrane. The vibratory transducer vibrates a thin elongate vibrationally conductive member such as a filament, whose other end is coupled to the tympanic membrane via a tympanic coupling element. The vibrationally conductive assembly is removably attached to the umbo of the tympanic membrane. The assembly conducts vibrations in the audible frequency range, while it absorbs static forces caused by device placement and ear canal movements.

In the Shennib '889 device (FIGS. 5-21) a vibrationally conductive assembly 38 conducts vibrations in the audible frequency range to tympanic membrane 18. Assembly 38 includes a thin elongate vibrationally conductive member (e.g., filament shaft) 30, and a tympanic coupling element (e.g., coupling pad) 31 that is placed on the tympanic membrane 18 when the hearing device is worn in the ear canal 10. The device has a microphone 51 that receives audio signals 52 from a source external to the ear. These audio signals are converted by the microphone to electrical signals and amplified by an amplifier 53. The amplified signal is applied to vibratory transducer 40, which generates vibrations representing the incoming audio signals 52.

The vibrationally conductive assembly or filament assembly 38 (FIGS. 6-8) is attached to the tympanic membrane 18 by weak adhesion forces between coupling pad 31 and the

tympanic membrane, by means described in the Shennib '889 specification, and vibratory transducer 40. Also, the filament assembly exerts minimal static forces on the tympanic membrane in the form of push, pull and forces along the plane of the tympanic membrane. Strain relief is provided in the filament assembly by means of a strain relief loop 34 that reduces stress of static and transient forces on the tympanic membrane. Coupling pad 31 is either permanently attached to filament shaft 30 or mechanically detachable therefrom. In FIG. 7, a detachable magnetic tip 37 articulates with receptor 36 so that filament shaft 30 can freely articulate with respect to the coupling pad and tympanic membrane, thereby providing strain relief to minimize the static and transient forces. The filament shaft can also be permanently attached (FIG. 6) or removably attached (FIGS. 7 and 8) to vibratory transducer 40.

The contact area of the coupling to the tympanic membrane is at the umbo area 20, and the coupling pad 31 has a conical shape that matches the natural shape of the umbo area for self-centering and relatively secure attachment therein.

In applicant's invention as disclosed and claimed in the instant specification, the hearing device (FIGS. 3-28) has a vibrational filament assembly 30 including a thin elongate vibrational conductive member (filament shaft) 40, and a tympanic coupling element (coupling pad) 60 that is placed on the tympanic membrane 18 to impart audible vibrations directly onto tympanic membrane of the wearer. The coupling pad 60 is weakly adhered to the tympanic membrane and is articulated relative to filament shaft 40 to accommodate individual variations in the orientation of the tympanic membrane. This is similar in structure and operation to that of the Shennib '889 device. In the present invention, however, the filament assembly is dynamically coupled to a vibration force element 70 (FIG. 4) to enable it to move relatively freely axially with respect to the vibration force element (e.g., FIG. 5) so that it produces substantially zero static pressure on the tympanic membrane, i.e., the filament assembly is statically floating, regardless of the exact position of the canal hearing device.

The filament assembly 30 includes filament shaft 40 coupled in an articulated manner to tympanic coupling pad 60 (FIG. 4), and vibratory element 45 responsive to vibration forces produced by vibration force element 70. The magnetic vibratory element 45 is free to move

within the air-core of coil 71 of the vibration force element in a friction-free manner and to vibrate axially of filament shaft 40. Other embodiments that allow this free floating operation between the filament assembly and the vibration force element are illustrated in FIGS. 6-8, 14A, 15A, 16A and B, and 17A.

Although the positional movement of the filament assembly 30 is illustrated as being primarily in the axial direction (one-degree of freedom), other degrees of freedom are achievable, such as by expanding the diameter of the air-core (FIG. 9) between the vibratory element 45 and the vibration force element 70 for a tilting motion (arrow 49) as well as an axial motion (arrow 47) when undergoing vibration. Thus, the filament assembly imparts audible vibrations on the tympanic membrane through a wholly dynamic coupling while fully absorbing any static and transient forces. Related rocking modes of vibration as well as axial vibration are illustrated by arrows 48 in the embodiments of FIGS. 14A and 15A. Combined axial and radial vibration motions are achieved in the embodiment of FIG. 17. Advantages of this structure and operation are fully described in the specification.

It should be apparent that Shennib '889 does not disclose or suggest a hearing device having a statically floating filament assembly, or one in which a filament assembly is dynamically coupled to a stationary vibration force element, as a consequence of which the filament assembly exerts substantially zero static pressure on the tympanic membrane. And applicant's claims do not recite mere statements of intended use without structural difference relative to the prior art characterized by Shennib '889, contrary to the examiner's assertions.

Base claims 1, 41 and 85 have been amended to more clearly distinguish applicant's invention over that disclosed by Shennib '889 and the other art of record. Base claims 82 and 94 have been canceled to focus on aspects of the invention described above, without prejudice to refiling those and/or similar claims in a continuation application. Base claim 83 is submitted to adequately distinguish patentable invention over Shennib '889 and the other prior art of record, but has been amended as well, solely to delete a typographical error (the word "on" in line 10).

As amended, claim 1 calls for, among other things, a "filament assembly ... dynamically coupled to said stationary vibration force element so as to be statically floating ... with respect to

said vibration force element, thereby ... imparting audible vibrations without exerting static forces [to the tympanic membrane]." These are positive recitations that clearly and patentably distinguish over Shennib '889. Contrary to examiner's assertions, Shennib '889 does not disclose a statically floating filament assembly, or a filament assembly dynamically coupled to a stationary vibration force element, or a filament assembly freely movable within an operable range relative to a stationary vibration force element to impart audible vibrations without static forces on the tympanic membrane, within the meaning given to those terms in applicant's specification or within any standard definition of those terms. And clearly these recitations are neither found in the claims of Shennib '889 nor are they mere obvious wording variations over the Shennib '889 claims. When examiner contends that these elements are present in the disclosure or claims of Shennib '889 she glosses over the actual identification of the purported elements in the reference. For example, filament assembly 38 of Shennib '889 is not statically floating with respect to vibration force element 40 of that reference. Rather, the filament assembly is firmly affixed to the vibration force element. It may have a strain relief, such as the loop 34 between the two, but by no means can that be characterized in any reasonable way as a statically floating relationship.

The same arguments apply in respect of claim 41 and method claim 85, as amended, each of these containing similar recitals. Claim 83, which is not further amended, already contains the recited limitations of "a vibrational filament assembly dynamically coupled to said vibration force element," ... "said vibrational filament assembly being essentially free floating ... with respect to said vibration force element," ... "for contacting the tympanic membrane and imparting audible vibrations without exerting essentially any static forces thereto."

The claims as amended herein are shown in marked-up form on Exhibit A, attached to this Amendment.

In view of the foregoing amendments and remarks, it is respectfully submitted that the nonstatutory double patenting rejection is in error and should be withdrawn. Likewise, a rejection based on section 102 requires that each and every element of the claim be found in the asserted reference, which clearly is not the case here. Hence, the reference does not constitute an

anticipation. Nor does the reference teach or suggest the point of departure constituting the invention here. Accordingly, it is respectfully submitted that this application is in condition for allowance. Such favorable action is earnestly solicited.

Respectfully submitted,

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EXHIBIT A

MARK-UP OF CLAIMS SHOWING AMENDMENTS THERETO

1 1. (Amended) A ~~statically floating~~ filament assembly constructed and adapted to fit
2 within the ear canal of an individual for contacting the tympanic membrane directly and imparting
3 audible vibrations thereto, said filament assembly being ~~dynamically coupled~~ operational relative
4 to a stationary vibration force element positioned in the ear canal at a distance from the tympanic
5 membrane, said filament assembly comprising:

6 (a) a vibratory element adapted to be laterally positioned when said filament assembly
7 is fitted within the ear canal, and arranged to respond to dynamic forces imparted by said
8 vibrational force element, and

9 (b) a vibrational shaft element extending medially for transferring audible vibrations
10 from said vibratory element to the tympanic membrane when said filament assembly is fitted
11 within the ear canal,

12 said filament assembly being dynamically coupled to said stationary vibration force
13 element so as to be statically floating and freely movable within an operable range with respect
14 to said vibration force element, thereby allowing individual adjustment and positioning of said
15 filament assembly for contacting the tympanic membrane and imparting audible vibrations
16 without exerting static forces thereto.

1 41. (Twice Amended) A canal hearing device adapted for directly contacting the
2 tympanic membrane and imparting audible vibrations thereto, comprising:

3 (a) a floating vibrational filament assembly for contacting the tympanic membrane
4 at its medial end,

5 (b) a stationary vibration force element positioned in the ear canal at a distance from
6 the tympanic membrane and operably associated with said vibrational filament assembly,

7 said vibrational filament assembly being dynamically coupled to said vibration force

8 element so as to be statically floating relative thereto and responsive to dynamic forces imparted
9 thereon by said vibration force element on said filament assembly for movement freely within an
10 operable range in at least one degree of freedom with respect to said vibration force element,
11 thereby allowing individual adjustment and positioning of said vibrational filament assembly for
12 contacting the tympanic membrane and imparting audible vibrations without exerting essentially
13 any static forces thereto.

1 83. (Twice Amended) A hearing device constructed and adapted to fit and be worn
2 within the ear canal of a human subject for imparting audible vibrations to the tympanic
3 membrane of the subject, comprising:
4 a microphone for receiving the incoming signals representative of audio signals and
5 converting them to electrical signals;
6 an amplifier for processing and amplifying the electrical signal output of the microphone;
7 a vibration force element responsive to said amplified signals for conversion thereof to
8 dynamic forces representative of said incoming signals; and
9 a vibrational filament assembly dynamically coupled to said vibration force element and
10 responsive to said dynamic forces imparted on by said vibration force element,
11 said vibrational filament assembly being essentially free floating within an operable range
12 in at least one degree of freedom with respect to said vibration force element, thereby allowing
13 individual adjustment and positioning of said vibrational filament assembly for contacting the
14 tympanic membrane and imparting audible vibrations without exerting essentially any static
15 forces thereto.

1 85. (Amended) A method of imparting audible vibrations on the tympanic membrane
2 of an individual comprising the steps of:
3 (a) attaching a vibratory filament assembly at its medial end to the tympanic
4 membrane; and
5 (b) ~~imparting mechanical vibrations representative of audio signals on the lateral end~~

6 ~~of said vibratory filament assembly, and~~
7 ~~—— (c)~~ dynamically coupling said vibratory filament assembly to a vibration force element
8 ~~whereby so that~~ said vibrational filament assembly is essentially free floating within an operable
9 range, in at least one degree of motion freedom, with respect to said vibration force element to
10 allow individual adjustment and positioning of said vibrational filament assembly for contacting
11 the tympanic membrane; and
12 (c) imparting mechanical vibrations representative of audio signals on the lateral end
13 of said vibratory filament assembly by means of said vibration force element so as to impart
14 audible vibrations thereto the tympanic membrane without exerting essentially any static forces
15 thereon.

Claims 82 and 94 are canceled.